DSA-5045: Machine Learning for Finance

Summer 2025 | East West University

Course Syllabus

Disclaimer:
The content of this syllabus is subject to expansion, modification, or refinement throughout the semester to accommodate evolving course needs and industry advancements.

Instructor Information

Md. Shafiqul Islam

- **Fulbright Scholar**, Saunders College of Business, Rochester Institute of Technology (RIT), Rochester, USA.
- **Senior Lecturer**, Department of Business Administration, East West University.

Research and Expertise:
Mr. Shafiq is an early-career researcher in accounting, finance, and development economics. His work has been published in leading journals in these fields. His current research focuses on **sentiment analysis over the capital market spectrum**. His current Google Scholar citation count is 240 (h index 6) with 12 peer-reviewed journal articles.

Teaching Philosophy:
Known for his innovative teaching methods, Mr. Islam is committed to creating an engaging and intellectually stimulating learning environment. He is passionate about empowering students with the skills and knowledge needed to excel in the fields of accounting, finance, and data analytics.

Contact Information

- **Email:** shafiqul@ewubd.edu
- **Office Hours:** By appointment only (schedule via Gmail).

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Course Description

This course provides a comprehensive introduction to leveraging Python for financial analysis and decision-making. Students will gain practical skills in data manipulation, visualization, statistical modeling, and portfolio optimization using key Python libraries such as pandas, NumPy, statsmodels, and pyfolio. The course is structured into six modules, each focusing on a distinct area of finance.

While this is not a pure programming course, students will gain proficiency in writing functions and scripts using Python, a versatile tool for data science.

Pre-requisites:

While there are no formal pre-requisites, this course is designed for students with a quantitative background. A foundational understanding of **financial concepts**, and **programming** is strongly recommended.

Course Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Utilize Python's fundamental data structures (lists, arrays, DataFrames) for financial data.
2. Perform essential financial calculations, including time value of money and loan simulations.
3. Work with time series data for financial analysis, including resampling and window functions.
4. Import and manage financial data from various sources (Excel, web).
5. Calculate and interpret key risk and performance metrics for financial portfolios.
6. Apply mean-variance optimization techniques to construct optimal portfolios.

Course Materials & Tools

1. **Software & Tools:**
    - **Python** (via Jupyter Notebooks or IDEs like PyCharm) for supplementary data analysis tasks.
2. **Hardware Requirements:**
    - A computer capable of running data-intensive applications (minimum 8GB RAM, multi-core processor).

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Course Schedule

Week	Topics	Deliverables
1	Introduction to Python for Finance Fundamentals	
2	Advanced Python Skills for Financial Data Handling	
3	Core Financial Concepts with Python and NumPy	**Quiz 1**
4	**Midterm Exam 1**	
5 - 6	Time Series Analysis for Financial Data	
7	Importing and Managing Financial Data	
8	Portfolio Analysis and Optimization	**Quiz 2**
9	**Midterm Exam 2**	
10 - 11	FinBERT for Financial Sentiment Analysis	
12	**Final Exam**	

Grading

Component	Points
Midterm Exam I	15
Midterm Exam II	15
Quiz (Avg.)	10
Attendance	5
Assignment (Avg.)	15
Final Exam	30
Total	**100**

Grade Scheme

Numerical Grade	Letter Grade		Grade Point
80% and above	A+	(A Plus)	4.0
75% to less than 80%	A	(A Regular)	3.75
70% to less than 75%	A-	(A Minus)	3.5
65% to less than 70%	B+	(B Plus)	3.25
60% to less than 65%	B	(B Regular)	3.0
55% to less than 60%	B-	(B Minus)	2.75
50% to less than 55%	C+	(C Plus)	2.5
45% to less than 50%	C	(C Regular)	2.25
40% to less than 45%	D		2.0
Less than 40%	F		0.0
Incomplete	I		
Withdrawn	W		

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Grading Policies

1. **Timely Submissions:**
    - Quizzes and exams are conducted in-class during scheduled times. Missing a quiz or exam without prior approval will result in a score of **zero**.
    - Assignments submitted up to **24 hours late** will incur penalties:
        - **<2 hours late:** 5% penalty.
        - **>2 hours but ≤24 hours late:** 10% penalty.
        - **>24 hours late:** Submissions will not be accepted, and a score of **zero** will be assigned.
2. **Specifications:**
    - Each deliverable (assignments, quizzes, exams) has clearly defined specifications, including format and submission requirements. Adherence to these specifications is mandatory.
3. **Documented Emergencies:**
    - In the event of a documented emergency (e.g., a medical emergency with official documentation), the instructor may, at their discretion, allow the student to make up missed points through an **extra assignment or exam** at the end of the course.

Academic Integrity and Plagiarism

At East West University, we are committed to fostering an environment of academic integrity. **Plagiarism, in any form, is a serious academic offense and will not be tolerated.** It undermines the value of your education, the hard work of your peers, and the integrity of the institution.

What is Plagiarism?

Plagiarism is presenting someone else's ideas, words, or work as your own without proper acknowledgment. This includes, but is not limited to:

- **Direct copying:** Reproducing text word-for-word without quotation marks and citation.
- **Paraphrasing without citation:** Restating someone else's ideas in your own words without giving credit to the original source.
- **Summarizing without citation:** Presenting a condensed version of someone else's work without proper attribution.
- **Using images, graphs, or data without citation:** Incorporating visuals or data created by others without acknowledging the source.
- **Submitting work done by someone else:** Turning in assignments completed by a friend, tutor, or an online service.
- **Self-plagiarism:** Submitting your own previous work (or parts of it) for a new assignment without permission from your instructor and proper citation.

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Why is it important to avoid plagiarism?

Beyond the academic penalties, understanding and avoiding plagiarism is crucial for your growth as a scholar and a professional. It teaches you:

- **Critical thinking:** To develop your own ideas and arguments.
- **Research skills:** To properly find, evaluate, and integrate information.
- **Ethical responsibility:** To respect intellectual property and acknowledge the contributions of others.

Consequences of Plagiarism

Any instance of plagiarism, intentional or unintentional, will result in serious academic penalties, which may include:

- **A failing grade on the assignment.**
- **A failing grade for the course.**
- Suspension from the university.
- Expulsion from the university.

These penalties will also be recorded on your academic record.

How to Avoid Plagiarism

- **Always cite your sources:** Whenever you use information, ideas, or words that are not your own, you must provide a proper citation. We will be using **APA** style in this course.
- **Understand when to quote and when to paraphrase:** Use direct quotes sparingly and only when the original wording is essential. Otherwise, paraphrase and summarize, but *always* cite.
- **Take careful notes:** When conducting research, keep meticulous records of your sources.
- **If in doubt, ask!** If you are ever unsure whether something constitutes plagiarism, please do not hesitate to ask me before submitting your work. I am here to help you understand and adhere to academic integrity standards.

Statement on the Use of Generative AI in Coursework

Generative Artificial Intelligence (AI) tools, such as large language models (LLMs), are rapidly evolving and becoming more accessible. These tools offer exciting possibilities for learning and productivity. However, it's crucial to understand their appropriate and inappropriate uses in this course.

Our goal is for you to develop your own critical thinking, analytical, and writing skills. While AI can be a helpful resource, it should not replace your learning process or your own intellectual effort.

Appropriate Uses of Generative AI (Permitted, with important caveats):

- **Brainstorming and Idea Generation:** You may use AI to generate initial ideas, explore different perspectives, or create outlines for assignments. However, the final ideas and structure must be your own, refined through your critical thought.

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- **Improving Writing Quality (Grammar, Spelling, Style):** AI tools can assist with proofreading, correcting grammar and spelling errors, and suggesting stylistic improvements. Think of it as an advanced spell-checker and grammar assistant.
- **Clarifying Concepts:** If you're struggling to understand a complex concept, AI can sometimes offer alternative explanations or examples.
- **Coding Assistance (for applicable assignments):** For coding tasks, AI can help with debugging, suggesting syntax, or explaining code snippets. **However, you are responsible for understanding the code, adapting it to the specific problem, and ensuring its correctness.**

In all permitted uses, you are ultimately responsible for the accuracy, originality, and integrity of the work you submit. You must critically evaluate any AI-generated content and ensure it aligns with the course material and your own understanding.

Inappropriate Uses of Generative AI (Strictly Prohibited and Considered Academic Misconduct):

- **Generating Full or Substantial Portions of Assignments:** Submitting any part of an assignment (e.g., essays, reports, analyses, code, answers to questions) that was primarily generated by AI and presented as your own original work. This includes direct copying, minor edits, or simply rephrasing AI output without significant intellectual contribution from you.
- **Replacing Your Own Critical Thinking and Research:** Relying on AI to perform the core analytical work, problem-solving, or research that is expected of you in an assignment.
- **Using AI to Fabricate Information or Sources:** Generating non-existent sources, data, or arguments to support your work.
- **Circumventing Learning Objectives:** Using AI to bypass the development of skills that the assignment is designed to teach (e.g., if an assignment is meant to improve your writing, using AI to write it completely defeats the purpose).

Transparency and Citation Requirements:

If you use generative AI tools in a permitted manner as part of your process, **you must disclose this use.** For example, you can include a brief statement at the end of your assignment or in a footnote describing how you used the AI tool. For instance:

- "Generative AI (e.g., ChatGPT) was used for brainstorming initial ideas for this essay."
- "Generative AI (e.g., Grammarly's AI features) was used to refine the grammar and sentence structure."
- "Generative AI (e.g., GitHub Copilot) was used for debugging and suggesting syntax in this code."

Failure to disclose the use of generative AI or using it in prohibited ways will be considered a violation of the University's Academic Integrity Policy and will be subject to the same severe penalties as plagiarism.

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